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ABSTRACT

This bulletin describes the courses offered at the five Federal Water Quality Administration training centers in the U.S. from July 1970 to December 1971. Information for applicants, applications for training forms and addresses of related Environmental Training Programs are included. The objective of the program is to provide specialized training in the causes, prevention, and control of water pollution. Training not generally available elsewhere is featured in specialized subjects, including recent developments in sanitary engineering, chemistry, aquatic biology, and microbiology in the field and in the laboratory. It is expected that training provided will lead to rapid application of new research findings, increase skills of technical and professional personnel, and train new employees recruited from other fields. (PB)

ED0 45431

BULLETIN OF COURSES

JULY 1970 TO DECEMBER 1971



U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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WATER POLLUTION CONTROL TRAINING PROGRAM

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER QUALITY ADMINISTRATION

010 2-11

Training for CLEAN WATER

The great question of the seventies is, shall we surrender to our surroundings, or shall we make our peace with nature and begin to make reparations for the damage we have done to our air, our land and our water?

Restoring nature to its natural state is a cause beyond party and beyond factions. It has become a common cause of all the people of America. It is a cause of particular concern to young Americans -- because they, more than we, will reap the grim consequences of our failure to act on programs which are needed now if we are to prevent disaster later.

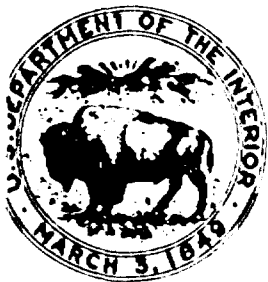
Clean air, clean water, open spaces -- these should once again be the birthright of every American. If we act now -- they can be.

Statement by President Richard M. Nixon
in the State of the Union Address delivered
before a joint session of the Senate
and the House of Representatives relative
to the State of the Union, January 22, 1970.

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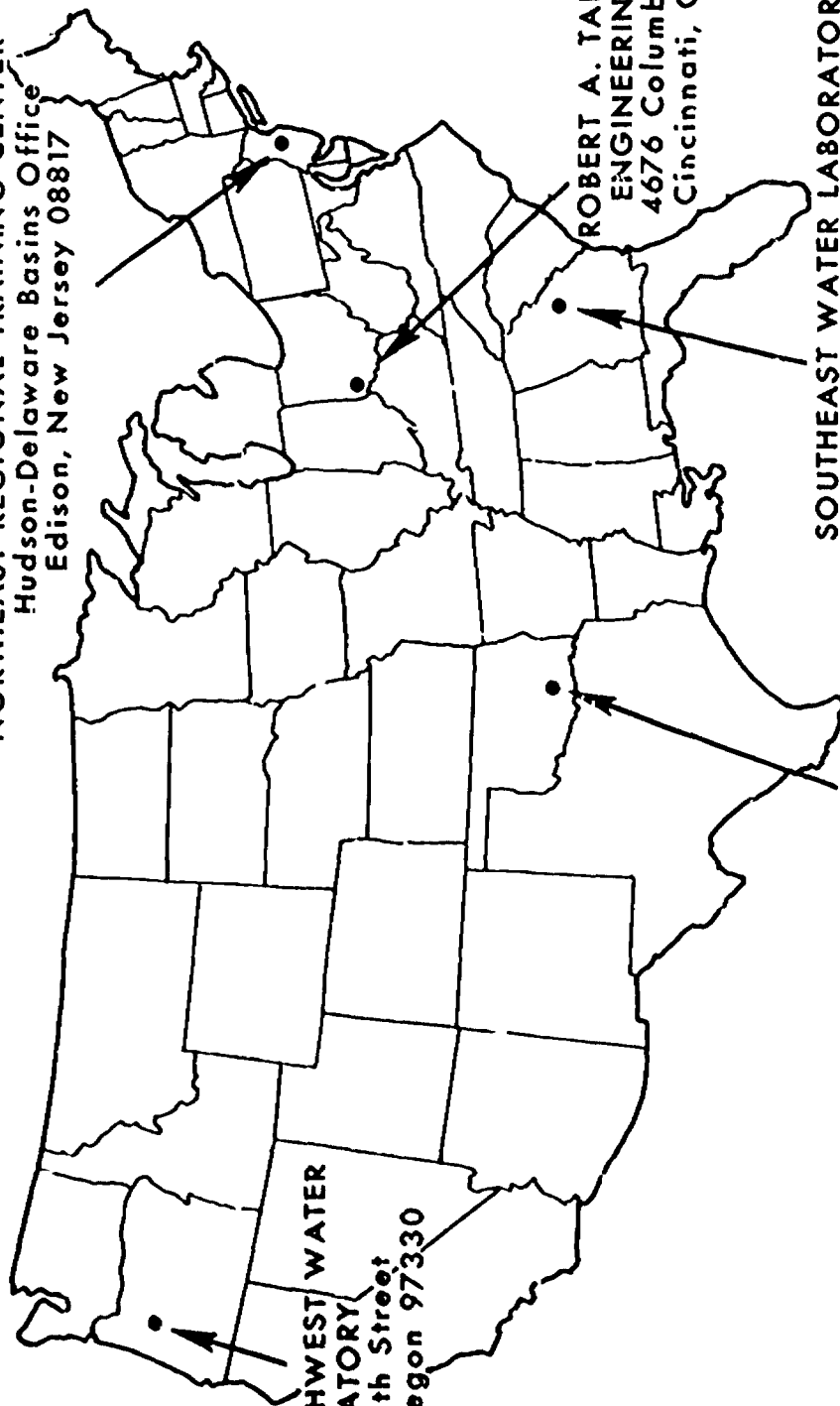
**WATER
POLLUTION
CONTROL
TRAINING
PROGRAM**



U.S. DEPARTMENT OF THE INTERIOR
Federal Water Quality Administration

FWQA TRAINING LOCATIONS

NORTHEAST REGIONAL TRAINING CENTER
Hudson-Delaware Basins Office
Edison, New Jersey 08817



PACIFIC NORTHWEST WATER
LABORATORY
200 S. 35th Street
Corvallis, Oregon 97330

ROBERT A. TAFT SANITARY
ENGINEERING CENTER
4676 Columbia Parkway
Cincinnati, Ohio 45226

SOUTHEAST WATER LABORATORY
College Station Road
Athens, Georgia 30601

ROBERT S. KERR WATER RESEARCH CENTER
P.O. Box 1198
Ada, Oklahoma 74820

Information for Applicants

The Federal Water Pollution Control Administration of the U.S. Department of the Interior conducts programs of research, technical assistance, enforcement, and training for water pollution control.

Training is offered by the Federal Water Pollution Control Administration at five locations in the United States. These locations are the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio; the Robert S. Kerr Water Research Center in Ada, Oklahoma; the Southeast Water Laboratory in Athens, Georgia; the Pacific Northwest Water Laboratory in Corvallis, Oregon; and the Hudson-Delaware Basins Office in Edison, New Jersey.

The objective of the Training Program is to provide specialized training in the causes, prevention, and control of water pollution. Training not generally available elsewhere is featured in specialized subjects, including recent developments in sanitary engineering, chemistry, aquatic biology, and microbiology in the field and in the laboratory. It is expected that this training will lead to rapid application of new research findings, increase skills of technical and professional personnel, and train new employees recruited from other professional or technical areas in the special skills required in water pollution control. Scientists, engineers, and recognized authorities from other FWPCA programs, other government agencies, universities, and industry, supplement the training staff by serving as guest lecturers and special consultants.

Most training is conducted in the form of highly technical, short-term, courses of one or two week's duration. The scope and level of these courses is designed to meet specific practical features of wastewater treatment plant design and operation, water quality evaluation in field and laboratory, and technical and administrative aspects of water quality management and water pollution control.

The primary responsibility of the States in the training of wastewater treatment plant operators is recognized. Accordingly, in training those directly responsible for operations of wastewater treatment plants, the FWPCA direct training role is to supplement and support, and not to supplant, State programs of operator training. In fulfilling this responsibility, the FWPCA training units do admit selected key personnel from wastewater treatment plants for training in subjects not generally included in the State programs of operator training. It is expected that these students will be able to transmit the benefits of their training to other operational personnel, either through formal training programs or through the informal type of training associated with on-the-job relationships.

Support of operator-training programs of the States is available through technical consultations in the planning and development of operator-training courses. Guest appearances of instructors from the Training Programs of the Federal Water Pollution Control Administration can be arranged; instructional materials such as training manuals, course plans, and training aids can be made available, subject to priorities of existing training schedules, or may be reproduced freely.

ADMISSION TO COURSES

Admission to courses is by application forms provided at the back of this Bulletin. Additional forms may be obtained from any training unit of the FWPCA shown on the page opposite.

NO TUITION OR REGISTRATION FEE IS CHARGED. Early application is advised, since course enrollments are limited. Students arrange for their own housing and transportation while attending courses. To apply for admission to a course, fill out an application from the back of this Bulletin, using a separate form for each course. (Where appropriate, please be sure to secure the signature of approval from the appropriate supervisor in your administrative chain of command.) Mail the application to the FWPCA training facility offering the course you wish to attend.

Information on local transportation and housing will be mailed to accepted applicants four to six weeks prior to course date. At this time, information will be provided with respect to the day and hour of course opening and closing. Please arrange travel plans to conform to the announced course schedule.

Related Environmental Training Programs

Listed below are other training programs which may be of interest to the reader of this bulletin. Inquiries about specific courses should be sent directly to the programs involved.

Chief, Training Institute
Environmental Control Administration
P. O. Box 30200
Cincinnati, OH 45230

Director, Office of Manpower Development
National Air Pollution Control Administration
P. O. Box 12055
Research Triangle Park, NC 27709

Chief, Training Branch
National Communicable Disease Center
Atlanta, GA 30333

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Course Descriptions

CHEMICAL ANALYSES FOR WATER QUALITY (100)

2 weeks

CINCINNATI, OHIO

July 13-24, 1970

February 1-12, 1971

This course is designed for chemists, biologists and engineers having a professional background and responsibility in performing, using, or interpreting chemical analyses for water quality.

Learning objectives for the student are:

- To understand selected tests employed in chemical analysis
- To know the advantages and limitations of specific test methods or instrumentation
- To select the more effective analytical methods
- To perform selected wet chemical and instrumental methods, and
- To evaluate results in terms of statistical inferences

Selected analytical procedures are presented in lecture-discussion sessions in the classroom outlining essentials of the tests, control techniques and interpretations. Various methods are stressed to increase specificity and validity of chemical criteria related to water pollution control, and compliance with water quality standards. About half of the course time is devoted to practice in laboratory operations. The students utilize wet chemical procedures and instrumentation for visible, infrared, flame and atomic absorption spectroscopy, dissolved oxygen, pH and conductivity meters. Calculations of results are performed in homework or workshop sessions and the results compared statistically in class discussions.

CHARACTERIZATION AND TREATMENT OF ORGANIC INDUSTRIAL WASTES (101)

2 weeks

ATHENS, GEORGIA

Sept. 28-Oct. 9, 1970

This course is offered for engineers, chemists, and other professional personnel concerned with the characterization and treatment of organic industrial wastes. The course is designed for persons who have some degree of specialization in industrial wastes surveys and treatment procedures but whose experience or range of coverage in this field is limited. The interests of both public officials and representatives of industry will receive coverage.

On completion of the course the student should be able to select and perform procedures for collecting, characterizing and measuring quantities of industrial water pollutants. It is also an objective of this course that the student be able to evaluate and select methods of treatment applicable to industrial wastes. This course has the further objective of providing insight to regulatory personnel on waste treatment problems and in bringing to the attention of industry the problems faced by water pollution control agencies in performing their job.

Participants will devote a considerable portion of course time to laboratory studies of organic pollutant detection techniques. Laboratory work will include column and thin-layer and gas chromatography and infrared spectroscopy. Laboratory and problem sessions will also be devoted to selection of adequate treatment methods for several organic industrial wastes. The wastes to be discussed include those from the textile production, pulp and paper, and oil refining industries.

The utilization of advanced waste treatment methods, especially as applied to removal of organic industrial wastes, will be covered. Time will be devoted to selection and use of monitoring equipment.

**PESTICIDE RESIDUE ANALYSIS
IN WATER (103.1)**
(Gas Chromatographic Systems and Techniques)

1 week

ATHENS, GEORGIA November 8-12, 1971

This course is primarily designed for professionals and technicians who are involved in the analysis of pesticide residue in water. The course includes an introduction to residue analysis and progresses into advanced use of the gas chromatograph.

After completing the course the student will be able to use extraction and cleanup procedures for the analysis of a water sample for pesticide content. He will be able to use a gas chromatograph for pesticide residue content in a water sample. He will be able to measure the cholinesterase inhibition in fish by applying colorimetric analysis.

The analytical procedures taught in the course will conform to those now being used by the Federal Water Pollution Control Administration in its investigations.

Subject matter to be covered includes:

- Extraction methods
- Sample preparation
- Sample analysis
- Methods for detection of cholinesterase inhibition
- Gas chromatography systems and function
 - Flow system
 - Temperature control
 - Electrometer
 - Detectors
 - Recorders
- Column technology
- Trouble shooting
- Quantitation

Laboratory practice will be emphasized, utilizing gas chromatographic systems.

**PESTICIDE RESIDUE ANALYSIS
IN WATER (103.2)**
(Infrared Spectroscopy and Thin Layer Chromatography)

1 week

ATHENS, GEORGIA December 6-10, 1971

This course is designed for analytical chemists or for technicians with suitable training or experience who are involved in the analysis of pesticide residue in water.

Upon completion of the course the participant will understand the basic principles of infrared spectroscopy for the interpretation of major functional groups applicable to pesticide residues. He will be able to apply basic procedures for the preparation of thin layer plates and the use of these as a cleanup procedure for pesticide residues prior to their identification by infrared spectroscopy.

The methods of instruction will include lectures, discussions and laboratory work on the following subjects.

- Principles and theory of infrared spectroscopy
- Basic instrumentation and accessories
- Interpretation of major functional groups
- Practical applications such as sampling techniques used in pesticide residue analysis
- Maintenance and trouble shooting of infrared equipment
- Principles of chromatography
- Preparation of thin-layer plates
- Spotting, developing and evaluating thin-layer chromatograms used for pesticide residue analysis

PESTICIDE ECOLOGY SEMINAR (103.3)

3 days

ATHENS, GEORGIA MARCH 29-31, 1971

This seminar is offered for personnel concerned with the effects of pesticides on the freshwater and estuarine biota.

The participant will recognize some of the major influences of pesticides on ecologic relations in environmental waters.

Particular attention will be centered on the distribution, fate, and effects of pesticides in water. The results of the latest research findings such as the effect of cycling on the pesticide, the role of sediments, and the role that the biota play on the pesticide will be stressed.

LABORATORY ANALYSES IN TREATMENT PLANT OPERATIONS (105.1)

1 week

ATHENS, GEORGIA April 19-23, 1971

This course is designed to fill a specific need of sewage treatment plant operators to properly perform the necessary chemical analysis required to evaluate plant operation and efficiency and to properly report these results to health departments. (The course is not concerned with plant operations and theory, nor does it deal with maintenance of equipment.)

The participants will be able to apply basic concepts of chemistry to the solving of problems relating to the preparation of standard solutions of reagents and the analysis of samples by volumetric and colorimetric analysis. This will be done to the satisfaction of the instructors in accordance with the standard methods for wastewater analysis.

Course topics will include:

- Atomic theory and atomic structure
- The Periodic Table
- Molecules, valence, formula
- Equations
- Chemical terminology
- Molarity
- Normality, equivalent weights, equivalents
- Sampling

Laboratory coverage will include:

- A. Volumetric analysis
 - BOD
 - Standardization of solutions
- B. Colorimetric analysis and ammonia determination
- C. pH
 - Proper use of meters
 - Calibration of meters
- D. Solids
 - Determination of settleable solids
 - Determination of suspended and total

INSTRUMENTAL ANALYSIS OF CHEMICAL POLLUTANTS IN THE AQUATIC ENVIRONMENT (107)

2 weeks

CINCINNATI, OHIO

April 5-16, 1971

This course is designed for professionals and technical specialists concerned with the selection and performance of procedures for the collection, identification and measurement of organic and inorganic pollutants in the aquatic environment. The training course "Chemical Analyses for Water Quality (100)" or previous experience associated with methodology pertaining to the measurement of chemical pollutants in water is prerequisite for attendance.

Upon completion of the course, the participant will be able to apply the fundamental concepts of infrared, thin-layer and gas chromatographic techniques for the analysis of organic pollutants and the technique of atomic absorption for the analysis of trace inorganic contaminants. He will have an understanding of the distribution and behavior of these pollutants in the environment and will be knowledgeable regarding improved techniques of sample preparation and automated analyses.

The analytical procedures taught in the course will conform to those currently in use by the Federal Water Pollution Control Administration in its official investigation. In addition, attention will be given to implications of the latest research.

Classroom presentations will include:

- Collection and preservation of water, sediment and biological samples
- Extraction methodology
- Column and thin-layer chromatography
- Gas chromatography and detector technology applicable for the analysis of phenols, pesticides and digester gases
- Comparative methodology and quality control

Laboratory practice will comprise one-half of the course content and will include the following analyses:

- Gas chromatographic analysis of phenols and digester gases
- Trace metals by atomic absorption
- Chlorinated hydrocarbons and phenyl alkanoic acid herbicides in water
- Organophosphorus and chlorinated hydrocarbon insecticides in sediment
- Automated analyses for nitrate, phosphorus and hardness

USE OF PHOTOGRAMMETRIC TECHNIQUES FOR WATER POLLUTION CONTROL (110)

1 week

CORVALLIS, OREGON December 6-10, 1971

This course is offered to employees of Federal and State agencies engaged in water pollution control programs. Such personnel may have either administrative or operational responsibilities and need not be experienced in the use of photogrammetric techniques.

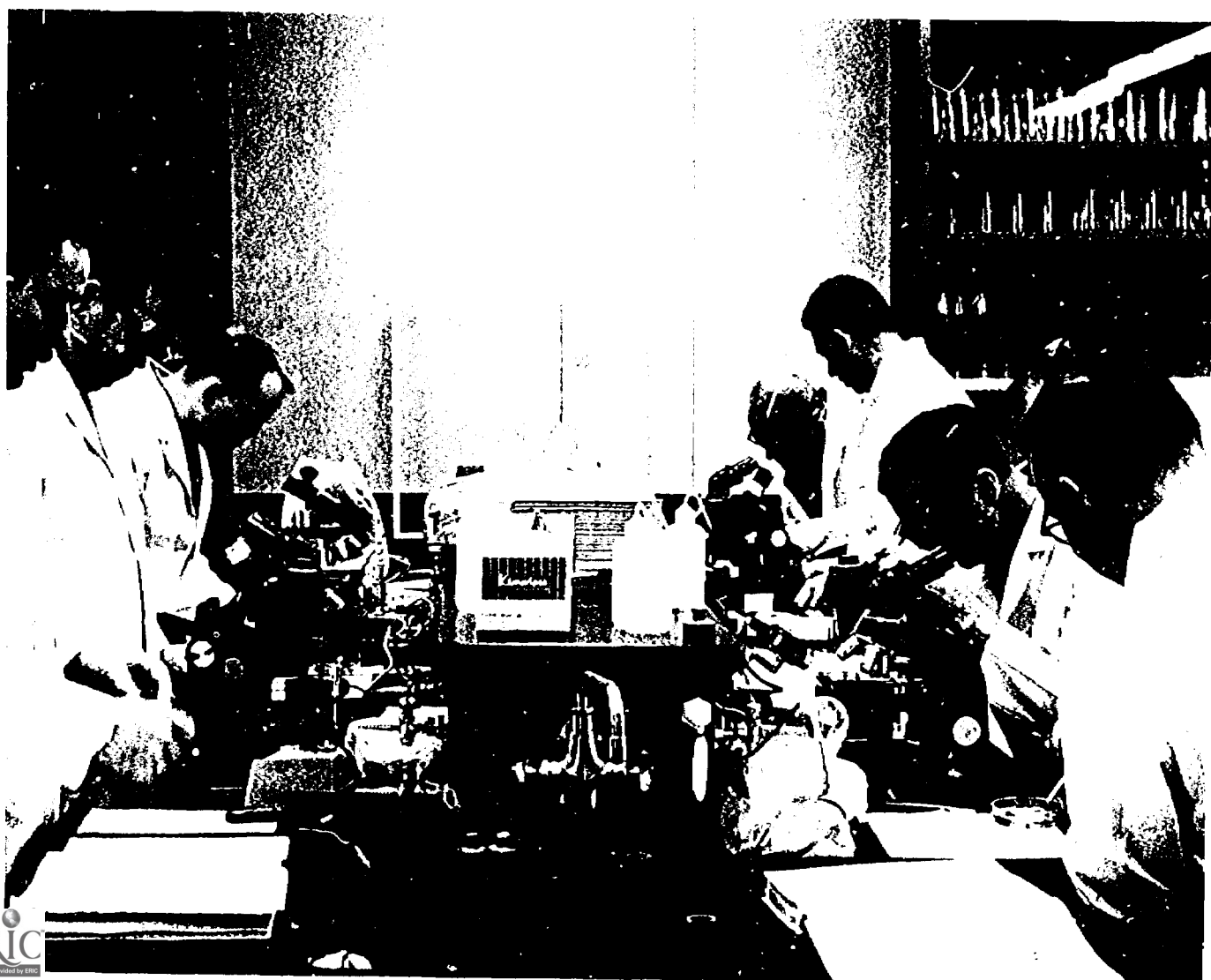
This course may also be of interest to other personnel, already engaged in program activities involving the use of aerial photography, who wish to investigate other applications of this valuable tool.

Upon completion of this course, the student will be familiar with the theory and application of photogrammetric techniques to water pollution control programs.

Course topics will include the following:

- Basic fundamentals of photogrammetry
- Photointerpretation
- Aerial-photographic surveillance systems
- Applications of photogrammetric techniques to water pollution control programs
- Infra-red and spectral photography

Training will be accomplished through lecture presentations, classroom discussions and case studies. Students may volunteer to present for discussion their own problems of a technical nature.



CURRENT PRACTICES IN WATER MICROBIOLOGY (120)

2 weeks

CINCINNATI, OHIO January 11-22, 1971
CORVALLIS, OREGON February 1-12, 1971

This course is designed for professional bacteriologists and other laboratory personnel engaged in the bacterial analysis of water.

The basic objective of the training is to provide the participant with knowledge and understanding of the significance of bacterial indicators of pollution. He gains the necessary skills required for detecting, measuring, and evaluating these pollution indicators.

Emphasis is given to the results of traditional as well as to recent investigations of bacterial indicators of pollution, including coliforms, fecal coliforms and fecal streptococci. The characteristics, environmental occurrence, significance and methods of detection and enumeration of these bacterial groups are studied in detail. In addition, attention is given to the detection of enteric pathogenic bacteria in polluted waters, as an adjunct to determination of indicator groups, and to the increasing utilization of such findings in investigations of water pollution.

Classroom presentations and extensive laboratory application give the participant opportunity to develop ability in use of the most suitable laboratory methods and in the interpretation of laboratory data. Both Standard Methods and promising new methods are included. Multiple dilution tube methods and membrane filter methods are featured in the laboratory studies.

The potential role of the microbiologist in water quality surveillance and in short-term pollution investigations is studied. Through this phase of the training it is expected that the student can increase the range of his contributions to the planning, conduct, and reporting of organized water quality studies.

MEMBRANE FILTER METHODS IN TREATMENT PLANT OPERATIONS (121)

1 week

ATHENS, GEORGIA March 1-5, 1971

The course is intended to meet the needs of treatment plant operators and others using membrane filters for the bacterial analysis of environmental waters and wastewaters. Applicants also are admitted from Federal, state or local water pollution control agencies and health departments, university faculties and private industry. Nonlaboratory personnel may be accepted for training, but should understand that the course subject matter and laboratory instruction are oriented to the needs of the laboratory worker.

Approximately half of the instruction is devoted to classroom presentations; all other scheduled activity is directed to a carefully planned and graded series of laboratory studies placing increasing demands on the exercise of individual skill and judgment in effective use of membrane filter methods. Students completing this course are able to apply the necessary techniques in use of membrane filters in water bacteriology. They can select, prepare and maintain laboratory supplies, equipment and culture media; they perform sample filtrations, incubation and examination of membrane filter cultures, including the computation and reporting of results. They can review their own laboratory practices and results critically for maintenance of the highest standards of performance. To provide assistance in meeting a provisional approval of membrane filter methods in the current (12th) edition of "Standard Methods for the Examination of Water and Wastewater" a protocol for comparative testing between membrane filter methods versus the multiple tube method is included in the course.

In addition, students are acquainted with several types of special membrane filter equipment suitable for use in field or emergency conditions. While the course normally is directed toward development of proficiency with equipment intended for use in the laboratory, special arrangements can be made whereby individuals can take the course with the entire laboratory program directed to use of field equipment.

FRESHWATER BIOLOGY AND POLLUTION ECOLOGY (140)

2 weeks

CORVALLIS, OREGON September 14-25, 1970
FAIRBANKS, ALASKA* May 17-28, 1971

This course is designed for engineering and scientific personnel other than biologists engaged in water pollution analysis and control activities; however, biologists new to the field of pollution control may find it useful for orientation.

Within the framework of his personal background, capacities, and experience, the student should be able, on completion of this course to:

- Understand the basic environmental factors impinging on aquatic communities
- Recognize or identify to broad groups most freshwater organisms commonly encountered, using correct procedures and appropriate literature when available and also using judgment in assessing his own technical capacity in regard to the degree of identification attempted
- Select and use appropriate common types of biological field collection equipment and procedures
- Select and use appropriate types of biological laboratory analytical equipment and procedures
- Analyze an aquatic community and assess the likelihood that it may have been disturbed by pollution
- Recognize biological indications of particular types of pollution when present
- Predict possible effects of a given type of pollutant on a given habitat
- Organize a field survey to determine the severity and extent of pollution

Course work includes lectures, discussions, problem assignments, and laboratory sessions. Field work is included to allow student participation in selecting and using biological field collection equipment and familiarization with biological communities.

Representative topics usually include:

- Aquatic organisms of significance in pollution surveys
- Biological sampling
- Types of aquatic insects
- Use of artificial substrates
- Thermal pollution
- Biological problems of lakes, reservoirs, and streams
- Investigation of fish kills
- Eutrophication in the freshwater environment
- Water quality criteria for aquatic life

Students should bring appropriate clothing for field work, including rainwear. Boots will be supplied locally.

*Applications for the Fairbanks, Alaska course should be submitted to: Manpower and Training Officer
Pacific Northwest Water Laboratory
200 S. 35th Street
Corvallis, Oregon 97330

BASIC FRESHWATER BIOLOGY (140.1)

1 week

CINCINNATI, OHIO

June 7-11, 1971

This course is designed as an introduction to aquatic biology for sanitary engineers, scientists, and others who are involved in freshwater pollution studies, surveillance, and control. Biologists new to the field of aquatic biology and pollution problems may find it useful for orientation.

The general objective is to enable nonbiologists to become familiar with aquatic organisms and to make observations and record data which will be of use in the analysis of quality of freshwater. This course provides only the basic taxonomic skills necessary for preliminary participation in pollution studies.

Within the framework of his personal background, capacities, and experience, the participant should be able on completion of this course to:

- Recognize or identify some aquatic organisms commonly encountered in the region in which the course was given, using correct procedures and appropriate literature when available, and also using judgment assessing his own technical capacity in regard to the level of identification attempted
- Select or recommend appropriate types of common biological field collecting equipment and procedures for use in various local circumstances
- Select or recommend appropriate types of common biological laboratory analytical equipment and procedures
- Use selected items of field and laboratory equipment
- Sort, enumerate, and count collections of aquatic macro-invertebrates and plants and properly record the results

"Basic Freshwater Biology" is primarily devoted to a systematic survey of the various types of freshwater plants and animals, with particular emphasis given to those with a known pollutional relationship. This course will be accepted as prerequisite for Course 140.2 "Freshwater Pollution Ecology." Persons registering for Course 140.1 should, at their earliest opportunity, register for Course 140.2, which provides the additional training necessary to properly interpret and apply biological observations.

Participants should bring clothing appropriate for field work, including rainwear. Boots will be supplied locally when required.

FRESHWATER POLLUTION ECOLOGY (140.2)

1 week

EDISON, NEW JERSEY September 14-18, 1970
CINCINNATI, OHIO June 14-18, 1971

This course is offered for aquatic biologists or persons with comparable experience concerned with and/or involved in the application of biological principles, techniques and parameters to pollution studies and abatement programs.

Within the limitations of his personal background capacities and experience, the student will be able on completion of this course to:

- Analyze an aquatic community and assess the likelihood that it may have been disturbed by pollution
- Evaluate the effect of environmental characteristics on the abundance, distribution or well-being of biota
- Recognize biological indications of particular types of pollution when present
- Predict possible effects of a given type of pollutant on a given habitat
- Organize a field survey to determine the severity and extent of pollution

Course work includes lectures, discussions, problem assignments and laboratory sessions.

Field work is included to allow student participation in selecting and using biological field collection equipment.

Representative topics usually include:

- Use of artificial substrates
- Thermal pollution
- Biological problems of lakes, reservoirs, and streams
- Investigation of fish kills
- Eutrophication in the freshwater environment
- Water quality criteria for aquatic life

Participants should bring appropriate clothing for field work (including rainwear). Boots will be supplied locally. This course may be offered separately on an advanced basis, in which case, applicants who have completed Course 140.1 will receive priority.

PLANKTON ANALYSIS (141)

2 weeks

CINCINNATI, OHIO October 5-16, 1970

This course is offered for professional personnel concerned with the evaluation of natural and polluted waters by means of plankton examination. Limited attention is also devoted to the examination and interpretation of the fauna of activated sludge and waste stabilization ponds.

Instruction enables the student to carry out basic laboratory procedures in the identification and counting of both phytoplankton and zooplankton. He will be capable of applying taxonomic procedures to plankton and recognize the major types he is likely to encounter. He will be able to calibrate a microscope and to carry counting and group identification to the point of obtaining results which are qualitatively and quantitatively reliable.

Attention is given to the significance of various types of counts. Forms frequently found in water and wastewater treatment plants and polluted environments are emphasized. Techniques for plankton control are presented. Time is provided for discussion of local problems, both in class and with specialists at the training facility.

Representative course topics usually include:

- Water quality problems of biological origin
- Identification of planktonic animals and plants
(a series of lectures and laboratories comprising approximately half of the course)
- Microscope calibration
- Plankton analysis
 - Sampling and preparation
 - Techniques of counting
 - Enumeration, methods selection
- Plant operation problems
 - Plankton in stabilization ponds
 - Activated sludge fauna
 - Toxic algae
 - Other biological treatment problems
- Plankton control
 - Plant control
 - Control in surface waters

Although microscopes are available for class use, more effective training results when it is given on the same instrument that will be used in the home laboratory. The microscope should have magnifications up to approximately 400X; oil immersion is optional. The student consequently is urged to hand-carry his own microscope to the course.

APPLIED BIOLOGY SEMINAR (146)

3 days

ATHENS, GEORGIA December 1-3, 1970

CINCINNATI, OHIO January 26-28, 1971

This course is intended for technically oriented persons concerned with planning, administering, collecting, evaluating, interpreting and reporting biological data related to water quality studies in both fresh and marine waters.

The main objective of this course is to promote more effective utilization of biological techniques which are fundamental in water pollution control. The student will develop a more complete understanding of the advantages and potential contributions of biological data and investigations to administrators, project leaders and others. Biologists will gain a better understanding of the limitations and restrictions placed on the administrator, and the nature of biological data which will be most useful for the improvement of water quality.

The following topics will usually be included:

- Orientation in the nature of the aquatic environment and aquatic ecology
- The nature of biological parameters
- Definition of "pollution" under various circumstances
- Orientations in the nature of various biological procedures and habitats such as taxonomy, benthos, periphyton, plankton, nekton, bioassays, and bacteriological investigations, followed by searching discussion of the potential of each in water quality enhancement
- Techniques for the evaluation and interpretation of biological data
- The multilateral problems of communication
- The use of biological data in the establishment and administration of water quality standards and criteria

Much of the course will consist of short formal presentations followed by extended informal discussions. Laboratory or field sessions usually are not scheduled, although an optional field excursion following the formal course may be arranged on occasion.

BIOASSAY IN POLLUTION ANALYSIS AND CONTROL (149)

1 week

CINCINNATI, OHIO November 16-20, 1970

November 8-12, 1971

This course is designed for those who need a practical competence in the design and use of bioassay and biomonitoring.

On completing this course the student should be able to select, design, construct, and operate a bioassay or biomonitoring setup adequate to meet most common needs in industry or regulatory organizations.

This course is considered to be at the application level. Knowledge will be provided for the more commonly accepted practices and principles involved in the laboratory use of aquatic organisms to detect or evaluate pollution.

The basic concept of the tolerance limit will be developed followed by the various ways by which it may be estimated. Static and flow through systems will be compared, as well as acute, sublethal, and chronic toxicity; single species versus community responses will be considered. Laboratory and field monitoring systems will be compared, and the types, sources, health, and care of experimental organisms that may be useful in different types of setups will be discussed.

Laboratory exercises and demonstrations constitute a significant portion of the course including an inspection trip to some nearby organization employing bioassay and/or related techniques if available.

The following topics are usually included as far as practicable:

- The nature of the tolerance limit
- Bioassay versus biomonitoring
- The role of laboratory versus field studies in water quality and fish kill investigations
- Chemical determinations associated with bioassay and biomonitoring
- Experimental organisms: types, sources, care and use
- The statistical design of bioassay
- The interpretation and application of results
- Case history studies of bioassay
- Laboratory practice in design and construction of equipment, and in running bioassays
- Laboratory demonstrations of additional types of setups

LABORATORY QUALITY CONTROL (150)

3 days

ADA, OKLAHOMA

January 19-21, 1971

Laboratory Quality Control is a three-day course designed for laboratory supervisors or those who are responsible for the validity of data produced in their organization. The course will provide a detailed description of the Federal Water Pollution Control Administration's extensive analytical quality control program and its implications to the South Central Region. Emphasis will be placed on its advantages to non-Federal laboratories and how any laboratory may participate. Federal Water Pollution Control Administration's Official Analytical Methods will be discussed and each trainee will receive copies of the methods manuals available.

Application of quality control techniques used to monitor laboratory operations and validation of data produced by the laboratory will be pursued in lecture and problem work sessions. Emphasis will be placed on chemical and microbiological analyses. A LABORATORY QUALITY CONTROL MANUAL will be given to each trainee. Data handling procedures will be discussed in detail.

Students should provide themselves with a slide rule and logarithm tables for the work sessions.

ANALYTICAL QUALITY CONTROL (151)

1 week

CINCINNATI, OHIO

November 1-5, 1971

One of the fundamental responsibilities of management is the establishment of a continuing program to ensure the reliability and validity of analytical laboratory and field data gathered in water pollution control activities. This course is addressed to laboratory directors, leaders of field investigations, and other supervisory personnel who bear prime responsibility for water and wastewater data used by FWPCA. Specifically, this will include all FWPCA laboratories, FWPCA field investigations, and public or private agencies which are recipients of FWPCA grants or contracts involving analytical tests and measurements.

The subject matter of the course is concerned primarily with quality control for chemical and physical tests and measurements. Upon satisfactory completion of the course, the student will be familiar with the influence and recommendations for control of a wide range of factors which can bear upon the reliability and validity of analytical results obtained in water pollution investigations. Upon his return to his place of duty, the student will be in a position to inaugurate, or to reinforce, a program of analytical quality control which will emphasize early recognition, prevention and correction of factors leading to breakdowns in the validity of data.

As appropriate, lectures, panel discussions, workshop activities, and laboratory inspections will be used for development of the following areas of consideration in analytical quality control programs:

- Need for internal quality control systems in analytical operations, and the motivation of all echelons of personnel involved in development and operation of quality control procedures;
- Development and validation of analytical methods, with particular reference to chemical and physical tests and measurements;
- Measuring and maintaining quality standards of laboratory services, such as distilled water, electricity, and compressed air;
- Specifications for laboratory instruments, evaluation, calibration, maintenance, and troubleshooting;
- Quality requirements for precision glassware, care and cleaning;
- Requirements for precise analytical work in preparation and use of reagents, purification, preparation and maintenance of primary standards;
- Use of control charts in laboratory operations; instructions for preparation and use, with consideration of relative merits of Cu Sum and Shewhart charts, use of control charts as a supervisory tool;
- Determination of precision and accuracy of individual tests and measurements; use of standards, replicates, and spiked samples;
- Data handling and reporting; sensitivity and detection limits, significant figures in reporting results, application of STORET;
- Special problems in analytical control in gas chromatography, trace organics analyses;
- Personnel aspects; skills and training required of analytical personnel, work loads and time requirements for routine analytical work, available training in water pollution analyses.

WATER QUALITY MANAGEMENT (160)

1 week

EDISON, NEW JERSEY March 8-12, 1971

This course is designed for middle management and staff personnel of Federal, interstate, and state water pollution control agencies. It is intended to provide a methodology whereby established policy can be transformed into well defined programs.

During the course, each student will increase his capability in:

- Assessing needs and assigning priorities to river basins for study
- Defining program objectives
- Defining and scheduling program components
- Determining technical, administrative, and socio-political constraints
- Estimating manpower and resource requirements
- Monitoring program success
- Motivating associates, subordinates, and others

The course gives instruction in the use of the methods of systems analysis to plan the management of water quality as a natural resource. It will show how to define plans for river basins that will manage the water quality of these basins for specific intervals of time. The course also deals with the organization of manpower to accomplish the work units of the management plans. This includes the sequencing of tasks and the use of flow charts, PERT, and allied techniques. It emphasizes the establishment of an organized team to accomplish well defined goals, and the characteristics of such a team in terms of communications, responsibility, creativity, and motivation.



INTRODUCTION TO WATER QUALITY STUDY AND SURVEY COURSES

Identification and measurement of water quality conditions is contingent upon the application of knowledge specific to particular branches of physical and biological sciences. Overall water quality evaluation, on the other hand, requires understanding of the interaction and interrelationship of chemical and biological parameters, hydraulic principles and hydrologic conditions prevailing in a defined area (drainage basin). Programs to prevent or limit adverse water quality situations must correlate the technology of measurements and evaluation with understanding of socio-economic and legal conditions, concepts and principles prevailing in the human community.

The following five courses are concerned with the factors used to determine water quality and to recognize and evaluate pollution. As such, the courses contribute to the overall objective of supporting programs to prevent or limit water pollution.

The content of the courses "Water Quality Surveys I and II (161.1 and 161.2)" and "Water Quality Studies (161)" is basically the same. The emphasis and depth of coverage is varied to serve the needs of professional personnel having diverse types of responsibilities in planning, performing and administering programs related to water quality. To select the appropriate course(s), applicants should review the individual course descriptions in terms of their particular interest and program responsibility.

Course 161.3 "Estuary Studies," and 161.5 "Field Investigation and Sampling Techniques" extend and amplify the scope of this series of water quality surveys and studies.

WATER QUALITY STUDIES (161)

2 weeks

CINCINNATI, OHIO September 13-24, 1971

CORVALLIS, OREGON July 12-23, 1971

FAIRBANKS, ALASKA* August 9-20, 1971

This course is offered for engineers, chemists, aquatic biologists, microbiologists and other professional specialists having administrative and operational responsibilities in planning and conducting water pollution surveys. The course is designed to be of greatest benefit to new professional workers in the field and to experienced workers whose normal duties in water quality surveys are too specialized to provide an overall view of the many special factors entering into the summation of an expression of water quality determination.

The course is intended to help participants understand the interdependency of various technical disciplines in evaluating water quality. Each student should be better able to identify his role and coordinate activities with other survey participants. He will be able to perform selected tests and measurements in each of the major areas of water quality surveys.

Students participate in classroom presentations, demonstrations and panel discussions. Field trips are conducted to local sites which are representative of the region in which the course is given. During the field trips students engage in observations and tests widely used by chemists, aquatic biologists and engineers in on-site studies. They collect samples for subsequent laboratory study and perform representative studies in the biology, microbiology, and chemistry laboratories.

Depending upon locations, major subject areas of the course may include:

- Sources and causes of deterioration of environmental water quality
- Tests and measurements used in evaluation of water quality by biologists, chemists, and microbiologists. This aspect of the course includes consideration of new technical developments in instrumentation and laboratory methodology.
- Fundamental factors in planning, conducting, interpreting findings and reporting results of a water pollution survey
- Special categories of water quality studies, including ground water quality studies, tidal water studies, water pollution surveillance networks
- Goals for water quality from the viewpoint of municipal and industrial water supplies, fish and wildlife management, agricultural usage and recreational use of waters.

*Applications for the Fairbanks, Alaska course should be submitted to:

Manpower and Training Officer
Pacific Northwest Water Laboratory
200 S. 35th Street
Corvallis, Oregon 97330

FIELD AND LABORATORY ACTIVITIES IN WATER QUALITY SURVEYS (161.1)

1 week

CORVALLIS, OREGON July 20-24, 1970
ADA, OKLAHOMA May 17-21, 1971

This course is designed for personnel actively engaged in field projects of water quality measurements and pollution identification. Emphasis is placed on understanding interdisciplinary needs and responsibilities in the accumulation and interpretation of data from field and laboratory activity.

Students will be able to apply new methods, techniques, and instruments used in field sampling and measurements, and in laboratory analysis of either collected or synthesized samples. They will develop an awareness of advantages and limitations of equipment, methods and techniques. Lectures and discussion periods develop an understanding of the related principles and theories.

Dependent upon course location, subject areas that may be covered include:

- General orientation to the aquatic environment and to the life systems existing within or dependent upon that environment
- Oxygen analyses in relation to various categories of pollutants
- Sampling techniques and analytical procedures in specific relation to Water Quality Standards compliance
- Procedures for sampling, identification, and enumeration of bacterial indicators of pollution
- Biological responses to pollution
- Flow measurements and current studies.

PLANNING AND ADMINISTRATIVE CONCEPTS OF WATER QUALITY SURVEYS (161.2)

1 week

ADA, OKLAHOMA March 22-26, 1971

This course is organized for the benefit of supervisory personnel and administrators responsible for planning and implementing programs to evaluate or improve water quality conditions.

The objective of the course is to strengthen the proficiency of planning and administrative personnel in water quality management programs.

The course covers the following elements of a survey in a logical sequence of planning and execution:

- Establishment of survey objectives
- Accumulation and evaluation of recorded data and literature
- Determination of information deficiencies
- Definition of interdisciplinary responsibilities
- Establishment of work schedule and determination of personnel and equipment needs
- Survey performance
- Compilation, integration and evaluation of accumulated data and information
- Report preparation and presentation
- Recommendation for future action (including possible alternatives) based on knowledge of socio-economic conditions and legislative authorization.

ESTUARY STUDIES (161.3)

1 week

ATHENS, GEORGIA June 7-11, 1971

CORVALLIS, OREGON November 8-12, 1971

The field of water pollution control in estuaries is a new one for persons concerned with clean water. This course is offered to professional specialists having an operational or an administrative responsibility for the study of estuaries. It is designed to provide a working knowledge of some of the basic concepts of the estuarine environment, the factors that will affect studies made in this environment and some of the special techniques used in its measurements.

Upon completion of the course the student will be familiar with some of the important physical, chemical and biological features of estuaries; be able to recognize some possible indicators of estuarine pollution; be able to apply some tested techniques for taking measurements; and have an appreciation of the sensitivity and variation in estuaries.

Topics to be covered include:

- Estuary variations that occur with changes in geography
- The basic types of estuaries
- The place of the estuary in food web ecology of economically important species of organisms
- The problems of sediments, dredging and light conditions
- The types of information necessary to make proper decisions and how to collect and interpret this information
- The pitfalls, importance, and statistical methods of sampling (what is valid data)
- Estuary flushing characteristics and other hydrologic features
- Problems and some solutions for instrumentation
- The use of aerial photography

Emphasis will be given to estuaries typical of the geographic area in which the course is conducted.

It is planned that this course will be given in a field location so that field trips and studies are an integral part of the course. Announcement of this location will be made to accepted students in time for them to make travel and housing arrangements. It is suggested that applicants do not plan to bring their families to this course because of expected working and living conditions. Enrollees should bring adequate field clothing, including tennis shoes, for field work in warm, shallow waters.

FIELD INVESTIGATIONS AND SAMPLING TECHNIQUES (161.5)

1 week

CORVALLIS, OREGON April 12-16, 1971

This course is intended for personnel responsible for the collection and analysis of water and wastewater samples in the field.

Upon course completion, the student will have a basis for applying the proper methodology and equipment for chemical, biological and microbiological sampling. Techniques and procedures for the analyses that should be performed in the field will be considered.

The following topics will be covered:

- Chemical sampling equipment
- Biological and bacteriological samplers
- Chemical field kits
- Bacteriological field kits
- Conductivity meters and probes
- Dissolved Oxygen meters and probes
- Flow measuring devices
- Field pH meters
- Sample preservation procedures
- Equipment maintenance

Training is accomplished by lecture, demonstration, and laboratory and field investigations. Ample time will be provided for discussion of sampling problems with which the student may be concerned.

BIOLOGICAL TREATMENT TECHNOLOGY (162)

2 weeks

CINCINNATI, OHIO September 14-25, 1970

September 27-October 8, 1971

This course is offered for engineers, chemists, and other professional personnel concerned with selection, design, or control of biological processes for wastewater and sludge treatment.

The course will enable participants to evaluate treatment feasibility, select and design a biological process, and control the biological treatment system for any wastes.

The course emphasizes biological treatment of complex or unusual wastes. Most of the concepts and principles discussed are equally valid and applicable for domestic waste treatment. Both aerobic and anaerobic processes are considered. Participants attend lectures and demonstrations, solve problems, and perform or observe laboratory experiments which illustrate process principles and economics.

A major portion of the course is devoted to the evaluation of treatability investigations for upgrading conventional biological processes or applying them in unusual or troublesome situations. Batch or continuous laboratory or pilot plant operations are considered as an aid in improving plant scale performance control or isolating problems requiring special consideration in process selection, design or operation.

Topics considered include evaluation of pertinent measured indices useful for information retrieval for guidance in selection, design and operation of wastewater treatment such as oxygen demand or respiratory activity, distribution or transfer dynamics, organic and hydraulic loading, solids production and characteristics, cyclic behavior and nonpollutional disposal of objectionable components among various aerobic, anaerobic, or facultative biological processes.

The individual who requires broader coverage of wastewater treatment technology should also consider future enrollment in courses "Physical-Chemical Treatment Technology (172.1)" and "Advances in Treatment of Domestic Wastes (172.2)."

CONTROL OF OIL AND OTHER HAZARDOUS MATERIALS (165)

3 days

CINCINNATI, OHIO

May 4-6, 1971

CORVALLIS, OREGON

June 15-17, 1971

EDISON, NEW JERSEY

October 13-15, 1971

This course is offered for employees of regulatory agencies who are assigned direct responsibility for control and alleviation of the effects of nonrecurring discharges of oil and other hazardous materials.

Upon completion of the course the student will be able to operate within interagency policies and guidelines concerning individual and agency responsibilities in event of discharge of hazardous materials. He will be familiar with the effects of such discharges and technological approaches to their control.

Considerable time is spent in explanation of Contingency Plans and Government regulations pertaining to such discharges. Procedures for satisfying these requirements and procuring technical services of the Federal Water Pollution Control Administration are explained using actual examples and case histories. Training is accomplished through lecture presentations, discussions, and -- most important -- the case-situation method. Participants will have an opportunity to practice response during such lessons.

STORET* SYSTEM (167)

1 week

CINCINNATI, OHIO

April 19-23, 1971

This course is intended for persons directly involved in processing water quality and water resources data. Such activities may include compiling, storing, retrieving, summarizing, collating, and analyzing water quality data.

Course participants will be able to apply improved skills for rapid and efficient utilization of the STORET automatic data processing system for storing, retrieving, and analyzing water quality data and other related information.

Instruction will be provided in the basic principles and capabilities of the system and in the specific techniques of stream and lake coding, data storage, data retrieval, and data analysis using the STORET System. Course problems are based on actual practice and will provide students with experience in station location coding, data storage and modification, and retrieval and analysis.

The role of remote terminals in the STORET System will be explained.

Persons attending should have a technical background and experience in water quality and resources work but need not have experience in computer programming. Persons with computer programming experience will find areas for further utilization of STORET principles relating to specialized problems.

* STORET - A coined word combining STORage and RETrieval.

DATA EVALUATION AND ANALYSIS (171)

1 week

CORVALLIS, OREGON March 15-19, 1971

CINCINNATI, OHIO May 17-21, 1971

This course is intended for personnel responsible for administration, planning and/or supervision of projects involving accumulations and interpretation of numerical information pertaining to water quality.

Upon course completion the student will have a basis for applying appropriate principles and methods applicable to data evaluation and analysis.

Instruction will be provided by professional specialists in the field of mathematical statistics who have developed highly sophisticated methodology and manipulative techniques which provide, for the other professions, the tools needed to accomplish the necessary evaluation and interpretation of accumulated data. Utilization of these complex tools requires subject coverage to provide:

Comprehensive understanding of statistical terminology and mathematical formulations
Knowledge of procedural and operational constraints essential in accumulation of the numerical information (data)

Understanding of the basic concepts of variation in mathematical functions in relation to variations in physical, ecological and environmental parameters

Understanding of the potentials for and limitations of data analysis and evaluation

Prospective students are invited to bring selected data evaluation and analysis problems, representative of their operations, for possible discussion during the course.

PHYSICAL-CHEMICAL TREATMENT TECHNOLOGY (172.1)

1 week

EDISON, NEW JERSEY November 2-6, 1970
CORVALLIS, OREGON November 16-20, 1970
CINCINNATI, OHIO December 7-11, 1970

This course is offered for engineers, chemists, and other professional personnel concerned with selection, design, and operational supervision of physical and/or chemical methods of wastewater and sludge treatment.

Upon course completion the student will have strengthened capability to evaluate the feasibility of treating wastewater by physical or chemical methods, select and design an appropriate process, and apply accepted control techniques to produce an acceptable effluent and conditioned sludge.

The course includes study of certain physical or chemical unit operations common to conventional treatment facilities and others that are useful for complex specialized wastewaters. Students participate in lectures, demonstrations, problems, discussions and laboratory course assignments, designed to illustrate process principles, operating advantages or limitations, feasibility and economics. The approach is a blend of the rational (theoretical) and the empirical (based on experience) methods of problem solving.

Course topics may include cooling, sedimentation, flocculation, mixing, flotation, incineration, vacuum filtration, solids concentration and drying, carbon absorption, and neutralization.

The individual who requires broader coverage of wastewater treatment technology should also consider future enrollment in courses "Biological Treatment Technology (162)" and "Advances in Treatment of Domestic Wastes (172.2)."

ADVANCES IN TREATMENT OF DOMESTIC WASTES (172.2)

1 week

CINCINNATI, OHIO December 14-18, 1970
ATHENS, GEORGIA October 18-22, 1971

This course is offered for professional personnel concerned with selection, evaluation, and improvement of methods for advances in treatment of domestic wastes. The course may be of special interest to employees of regulatory agencies and consulting engineering firms.

Upon completion of the course the student will have increased competence to compare alternative methods and select processes to meet critical product quality and economic requirements.

Course content includes operations and processes selected to tailor used water quality to fit beneficial reuse requirements beyond those possible with conventional treatment. This may involve more complete removal of general contaminants or special processes designed to remove components inefficiently removed by conventional processing.

Students will participate in lectures, discussions, problem solving, demonstrations, laboratory and case histories designed to increase their capabilities in the selection, design and operational control of treatment facilities considering rational, empirical and socio-economic factors.

In accordance with local requirements, course topics are selected from the following:

- Filtration and screening
- Chemical clarification
- Granular and powdered carbon absorption
- Oxidation
- Distillation
- Electrodialysis
- Ion exchange
- Reverse osmosis
- Phosphate removal
- Nitrogen removal
- Disinfection
- Ultimate disposal
- Upgrading conventional treatment

This is a companion course to Course No. 162, "Biological Treatment Technology" and Course No. 172.1, "Physical-Chemical Treatment Technology." It is recommended that prospective trainees complete these courses or possess equivalent prior experience.

ORIENTATION TO WASTEWATER TREATMENT OPERATION (173)

1 week

CINCINNATI, OHIO

August 3-7, 1970

August 2-6, 1971

This course is offered for personnel who are inexperienced in treatment plant operations. It is also recommended for those individuals in state and regional programs who are responsible for designing and conducting operator training courses.

Upon course completion the student will be familiar with:

- Characteristic effects of wastewaters upon water quality
- Treatment operations used to remove objectionable pollutants
- Basic factors of operational control and maintenance
- Essentials of testing plant performance and reporting results
- The operator's function in water pollution control

Treatment facilities will be presented in terms of unit operations such as collection, pumping, clarification, mixing, flocculation, aeration, oxidation and incineration. Engineering applications of these will be combined into processes in terms of the biological, chemical or physical behavior. Typical plant schematic diagrams will be used to facilitate recognition of plant units, their function and care. The same schematics will be used in presentation of basic tests, and calculations involving flow, concentration and loading as used for plant operational reports.

The teamwork approach will be stressed among the operator, his associates, his supervisors, his public, and local, state or regional agencies with respect to the services and information expected from him and the nature of assistance that he may obtain from others.

PLANNING, DEVELOPMENT AND MANAGEMENT OF WASTEWATER TREATMENT FACILITIES (175)

1 week

CINCINNATI, OHIO

July 19-23, 1971

This course is intended for planning and management personnel from public and private agencies planning to install new wastewater treatment facilities or to undertake major construction to improve existing facilities.

Participation in the course is expected to strengthen the capability of the student to plan, develop, and implement facilities for wastewater treatment.

As appropriate, lectures, panel discussions, general discussions, and case studies are used in consideration of the following topics:

- Responsibilities and interrelationships of Federal, State and local agencies concerned with water quality enhancement
- Public relations techniques designed for information and development of support before, during and after project development
- Essential steps necessary to evaluate existing conditions and needs in line with water quality objectives
- Considerations involved in financing planned construction of needed facilities
- Interrelationships of the Consultant, Contractor, public agencies and the public in the water pollution control effort
- The human factor will be stressed in making the completed facility a functional entity. Means whereby operating personnel may be motivated and trained to recognize proper function of each element of the facility and to achieve optimum performance on a continuing basis will be considered.

SEWAGE TREATMENT FACILITIES FOR FEDERAL INSTALLATIONS (177)

1 week

ANCHORAGE, ALASKA* October 12-16, 1970
CORVALLIS, OREGON October 26-30, 1970
October 4-8, 1971
ATHENS, GEORGIA May 10-14, 1971

This course is offered for supervisors, engineers, and other Federal personnel responsible for design, construction, or management of sewage disposal facilities at Federal installations. The course may also be of interest to engineers and supervisors in State and local agencies having responsibility for recreational areas and small institutions.

On completion of this course, the student will have requisite technical information to assess a sewage treatment and disposal problem and to select the most advantageous system for a given location.

The course will cover waste treatment methods including those applicable to installations such as National Parks, Forest Service camps, small military installations, hospitals, schools and prisons.

In addition to the technical aspects of waste treatment and disposal, the legal responsibilities of public agencies, as they relate to adequate sewage treatment and disposal will be covered.

Course topics include:

Federal policy and guidelines, Executive Order 11507,
States' criteria and requirements
Septic tank and drainfield applications
Secondary sewage treatment methods
Sewage lagoon applications
Tertiary treatment methods
Disinfection of effluents
Surveillance and operational controls
Preliminary engineering studies.

*Applications for the Anchorage, Alaska course should be submitted to: Manpower and Training Officer
Pacific Northwest Water Laboratory
200 S. 35th Street
Corvallis, Oregon 97330

ANALYSIS AND CONTROL OF THERMAL POLLUTION (178)

4 days

CINCINNATI, OHIO August 24-27, 1970
December 13-16, 1971
CORVALLIS, OREGON December 7-10, 1970

This course is designed for professional personnel concerned with the evaluation, design, operation or monitoring of thermal discharges. Orientation in the biological significance of thermal discharges is also included.

On completion of this course the student should be able to:

- Evaluate the potential magnitude and extent of a heated discharge from a power plant or a cooling discharge from a storage reservoir
- Determine the nature and size of treatment structures necessary to produce an acceptable level of discharge temperature
- Understand the thermodynamic behavior of rivers and impoundments and the potential biological needs of aquatic organisms so that optimum types of discharge devices may be installed

Instruction includes an overview of the present day magnitude and future potential of thermal discharges with special reference to power production plants of various types. Orientation is also provided in the potential biological effects of both artificially heated and cooled waters and in the significance of the rate of change of temperature. Class problem sessions in small groups enable the student to obtain personal practice in the calculations necessary for predicting the physical impact of various types of thermal discharges. Types of biological information needed to evaluate the potential effectiveness of the engineering predictions are also included.

Representative topics include:

- Thermal sources and loads
- Physical and chemical effects of thermal pollution
- Biological effects of various types of thermal discharges
- Process changes
- Waste heat utilization
- New methods of power generation
- Power generation
- Cooling devices
- Dispersion, dilution and flow regulation
- Water temperature prediction
- Data requirements, field studies and instrumentation
- Work problem sessions

OPERATOR INSTRUCTOR DEVELOPMENT (180)

1 week

CINCINNATI, OHIO August 10-14, 1970
 August 9-13, 1971

This course is offered for persons having a responsibility for designing, managing and/or conducting various types of "short courses" for wastewater treatment plant operators.

Upon completion of the course the student will be able to write proper course objectives, design a course for a specific training level, and evaluate course content and course value. He will be able to prepare and present a meaningful talk to an audience. He will be able to advise others on types of instruction, classroom management, and proper instruction techniques.

The course will review current teaching methods and the preparation and management of short term training courses. Considerable time will be devoted to discussion and practice of training methods and materials. Special attention will be given to the material that should be included and excluded from operator short courses and to levels of instruction. A portion of the course will be devoted to a review and discussion of existing course materials available for the training of wastewater plant operators.

Topics to be covered include:

- Determination of training needs and objectives
- Course design
- Preparation and use of training aids
- Evaluation of training courses

Continuing construction and expansion of wastewater treatment facilities by all segments of society, coupled with an expanded technology, has increased the need for training and upgrading wastewater treatment plant operators. Many persons concerned with giving this training have had no formal instruction in teaching. This course will fill, in part, a special growing need in the water pollution control field.

OTHER TRAINING COURSES

The Training Program of the Federal Water Pollution Control Administration has, in recent years, developed and conducted numerous courses not scheduled in the period covered by this edition of the Bulletin. Among these may be listed the following, which may be offered upon demonstration of need for the training:

COURSE NO.	LENGTH	TITLE
103	2 weeks	Analysis of Pesticides in the Aquatic Environment.
106	1 week	Orientation to Automated Instrumentation in Surveillance.
120.1	1 week	Survey of Current Practices in Water Microbiology.
120.2	1 week	Bacterial Methods in Water Pollution Surveillance
142	1 week	Introductory Microscopic Analysis of Water
144	2 weeks	Marine Biology and Pollution Ecology
144.1	1 week	Basic Marine Biology
144.2	1 week	Marine Pollution Ecology
168	1 week	Geohydrologic Relationships in Water Pollution
172	2 weeks	Physical-Chemical Treatment of Wastewaters and Sludges
176	3 days	Water Pollution Control in Federal Installations

If need for any of these courses, or in any other area of specialized technical training in the field of water pollution control is recognized, the reader is invited to bring the need to any of the FWPCA training units listed in this Bulletin. Such recommendations will receive full consideration in development of future training plans and schedules.

Ada, Oklahoma
Athens, Georgia
Cincinnati, Ohio
Corvallis, Oregon
Edison, New Jersey

**FEDERAL
WATER
POLLUTION
CONTROL
ADMINISTRATION
FACILITIES**

offering

Water Pollution Control Training

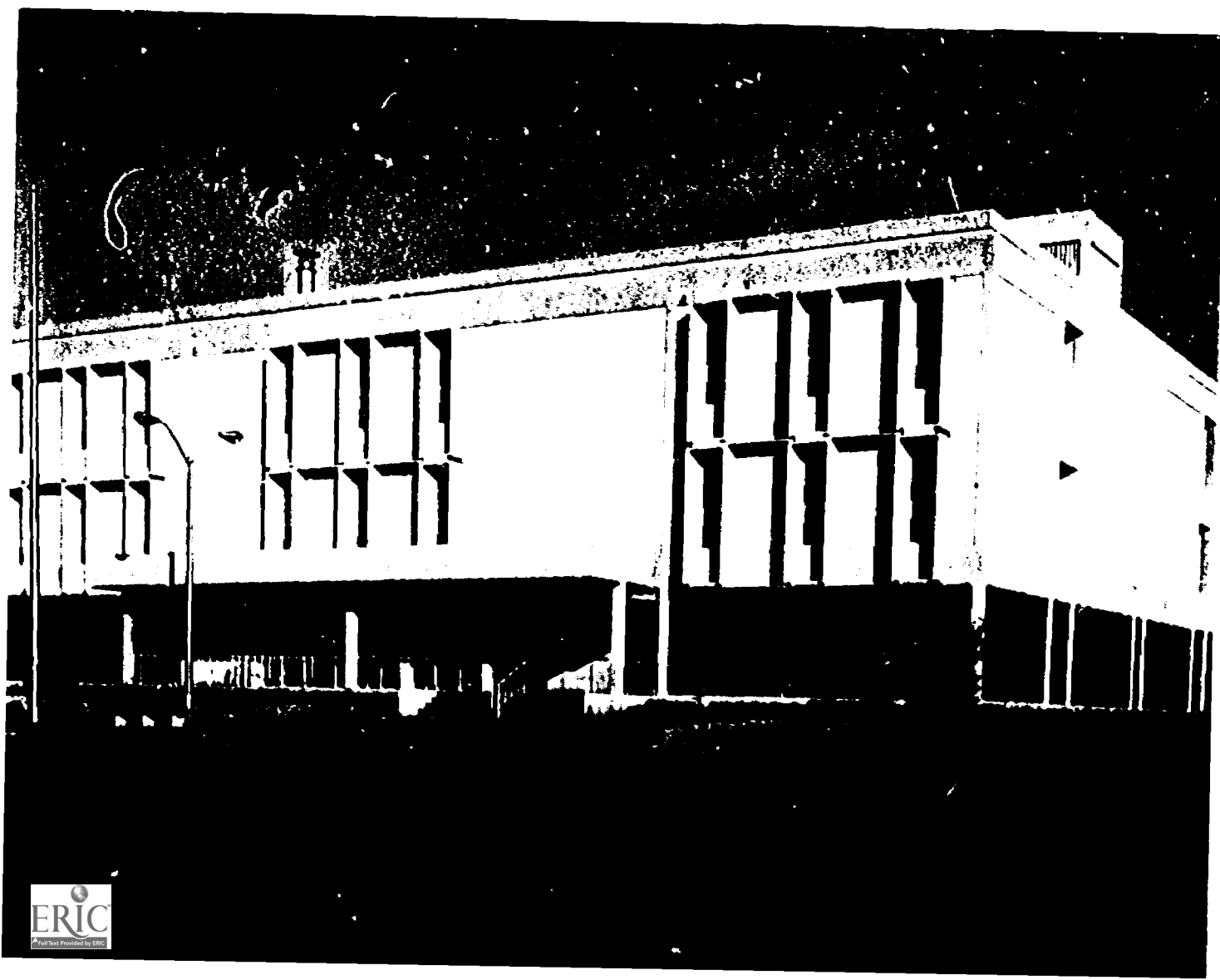
THE ROBERT S. KERR WATER RESEARCH CENTER

P. O. Box 1198

Ada, Oklahoma 74820

Commercial telephone number: Area Code 405 332-8800

FTS calls may be placed through Oklahoma City FTS Operator
(405-236-2311); then ask for Ada 332-8800.



**COURSES TO BE OFFERED BY
THE ROBERT S. KERR WATER RESEARCH CENTER
Ada, Oklahoma**

Laboratory Quality Control (150) January 19-21, 1971

Planning and Administrative Concepts of Water
Quality Surveys (161.2) March 22-26, 1971

Field and Laboratory Activities in Water
Quality Surveys (161.1) May 17-21, 1971

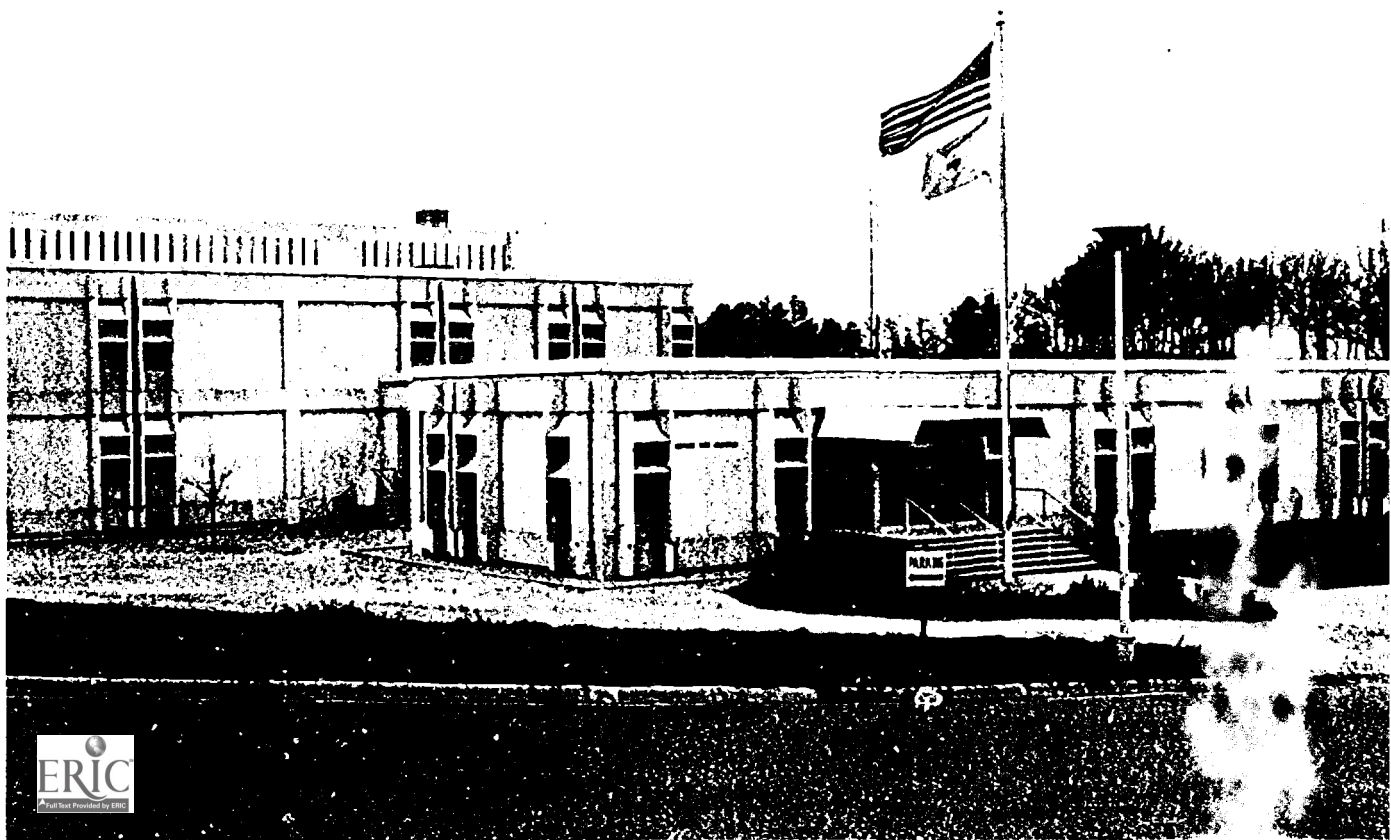
THE SOUTHEAST WATER LABORATORY

College Station Road

Athens, Georgia 30601

Commercial telephone number: Area Code 404 548-5641, Ext. 7261

FTS number: 404-548-7261



COURSES TO BE OFFERED BY
THE SOUTHEAST WATER LABORATORY
Athens, Georgia

Characterization and Treatment of Organic
Industrial Wastes (101) September 28--October 9, 1970

Applied Biology Seminar (146) December 1-3, 1970

Membrane Filter Methods in Treatment
Plant Operations (121) March 1-5, 1971

Pesticide Ecology Seminar (103.3) March 29-31, 1971

Laboratory Analyses in Treatment Plant
Operations (105.1) April 19-23, 1971

Sewage Treatment Facilities for Federal
Installations (177) May 10-14, 1971

Estuary Studies (161.3) June 7-11, 1971

Advances in Treatment of Domestic Wastes (172.2) October 18-22, 1971

Pesticide Residue Analysis in Water (103.1) November 8-12, 1971

Pesticide Residue Analysis in Water (103.2) December 6-10, 1971

THE ROBERT A. TAFT SANITARY ENGINEERING CENTER

4676 Columbia Parkway

Cincinnati, Ohio 45226

Commercial telephone number: Area Code 513 871-1820, Ext. 259

FTS number: 513-871-6259



COURSES TO BE OFFERED BY NATIONAL TRAINING CENTER

Cincinnati, Ohio

Chemical Analyses for Water Quality (100)	July 13-24, 1970
Orientation to Wastewater Treatment Operation (173)	August 3-7, 1970
Operator Instructor Development (180)	August 10-14, 1970
Analysis and Control of Thermal Pollution (178)	August 24-27, 1970
Biological Treatment Technology (162)	September 14-25, 1970
Plankton Analysis (141)	October 5-16, 1970
Bioassay in Pollution Analysis and Control (149)	November 16-20, 1970
Physical-Chemical Treatment Technology (172.1)	December 7-11, 1970
Advances in Treatment of Domestic Wastes (172.2)	December 14-18, 1970
Current Practices in Water Microbiology (120)	January 11-22, 1971
Applied Biology Seminar (146)	January 26-28, 1971
Chemical Analyses for Water Quality (100)	February 1-12, 1971
Instrumental Analysis of Chemical Pollutants in the Aquatic Environment (107)	April 5-16, 1971
STORET System (167)	April 19-23, 1971
Control of Oil and Other Hazardous Materials (165)	May 4-6, 1971
Data Evaluation and Analysis (171)	May 17-21, 1971
Basic Freshwater Biology (140.1)	June 7-11, 1971
Freshwater Pollution Ecology (140.2)	June 14-18, 1971
Planning, Development and Management of Wastewater Treatment Facilities (175)	July 19-23, 1971
Orientation to Wastewater Treatment Operation (173)	August 2-6, 1971
Operator Instructor Development (180)	August 9-13, 1971
Water Quality Studies (161)	September 13-24, 1971
Biological Treatment Technology (162)	September 27-October 8, 1971
Analytical Quality Control (151)	November 1-5, 1971
Bioassay in Pollution Analysis and Control (149)	November 8-12, 1971
Analysis and Control of Thermal Pollution (178)	December 13-16, 1971

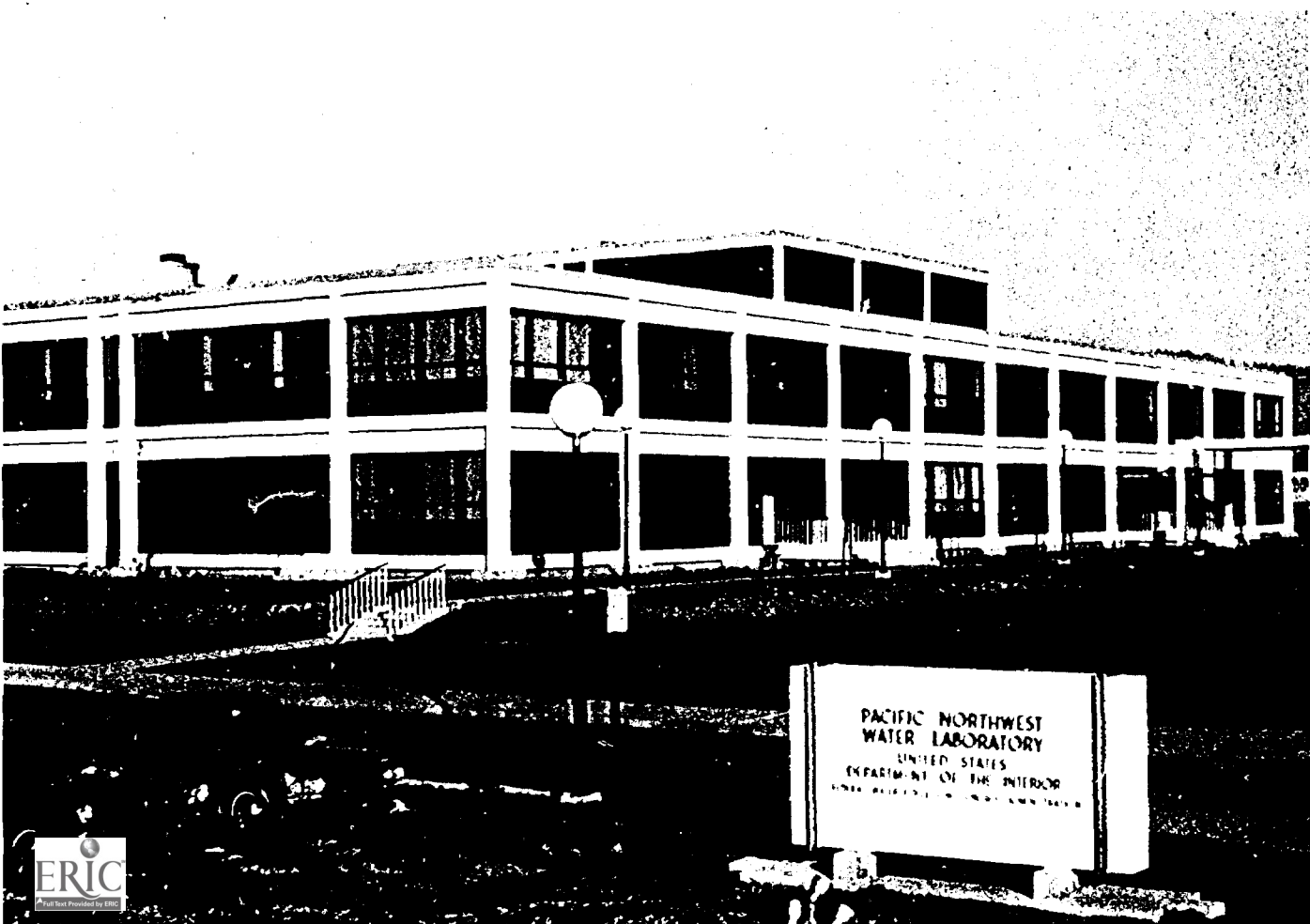
THE PACIFIC NORTHWEST WATER LABORATORY

200 South 35th Street

Corvallis, Oregon 97330

Commercial telephone number: Area Code 503 752-4281, Ext. 318

FTS number: 503-752-4318



COURSES TO BE OFFERED BY
THE PACIFIC NORTHWEST WATER LABORATORY
Corvallis, Oregon

Field and Laboratory Activities in Water
Quality Surveys (161.1) July 20-24, 1970

Freshwater Biology and Pollution Ecology (140) September 14-25, 1970

Sewage Treatment Facilities for Federal
Installations (177) October 12-16, 1970
(Alaska)

Sewage Treatment Facilities for Federal Installations (177) October 26-30, 1970

Physical-Chemical Treatment Technology (172.1) November 16-20, 1970

Analysis and Control of Thermal Pollution (178) December 7-10, 1970

Current Practices in Water Microbiology (120) February 1-12, 1971

Data Evaluation and Analysis (171) March 15-19, 1971

Field Investigation and Sampling Techniques (161.5) April 12-16, 1971

Freshwater Biology and Pollution Ecology (140) May 17-28, 1971
(Alaska)

Control of Oil and Other Hazardous Materials (165) June 15-17, 1971

Water Quality Studies (161) July 12-23, 1971

Water Quality Studies (161) August 9-20, 1971
(Alaska)

Sewage Treatment Facilities for Federal Installations (177) October 4-8, 1971

Estuary Studies (161.3) November 8-12, 1971

Use of Photogrammetric Techniques in Water
Pollution Control (110) December 6-10, 1971

HUDSON-DELAWARE BASINS OFFICE

Northeast Regional Training Center

Edison, New Jersey 08817

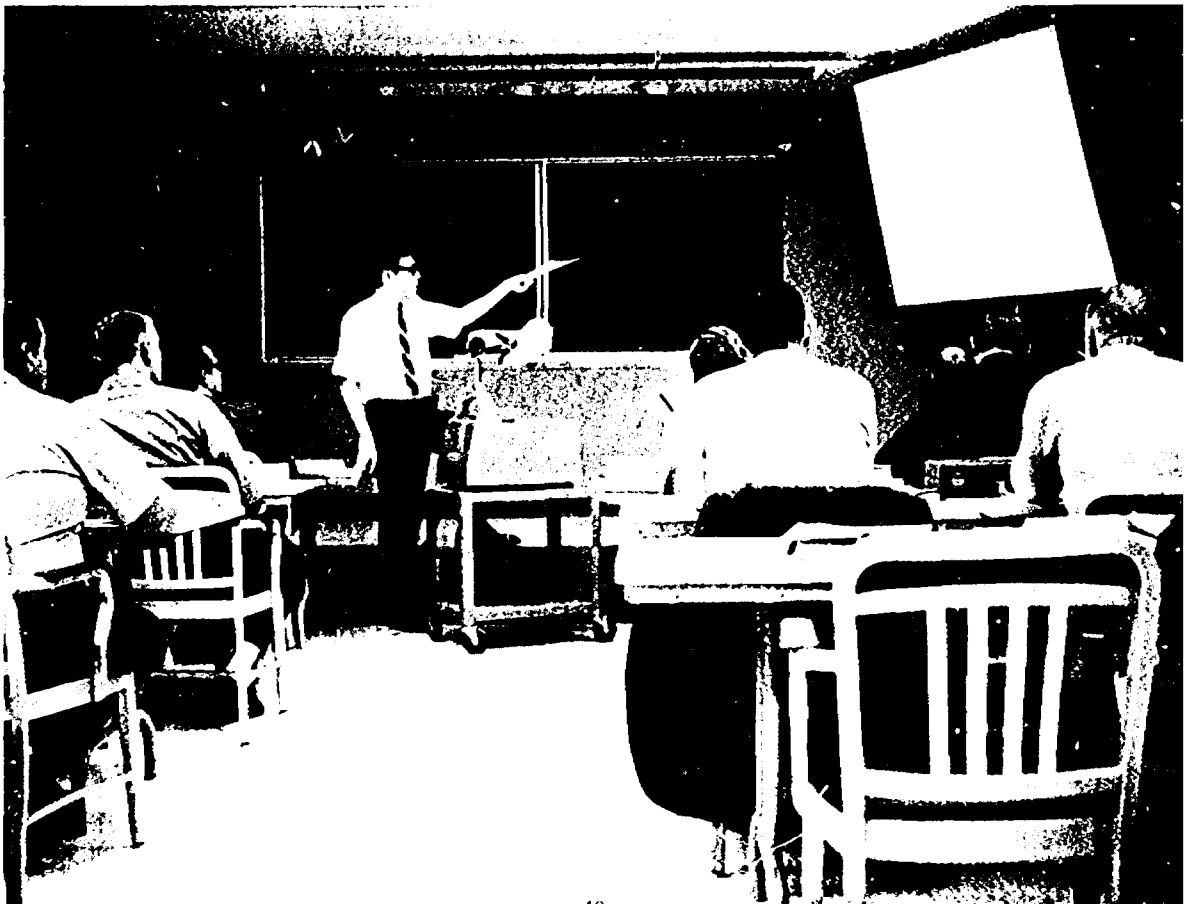
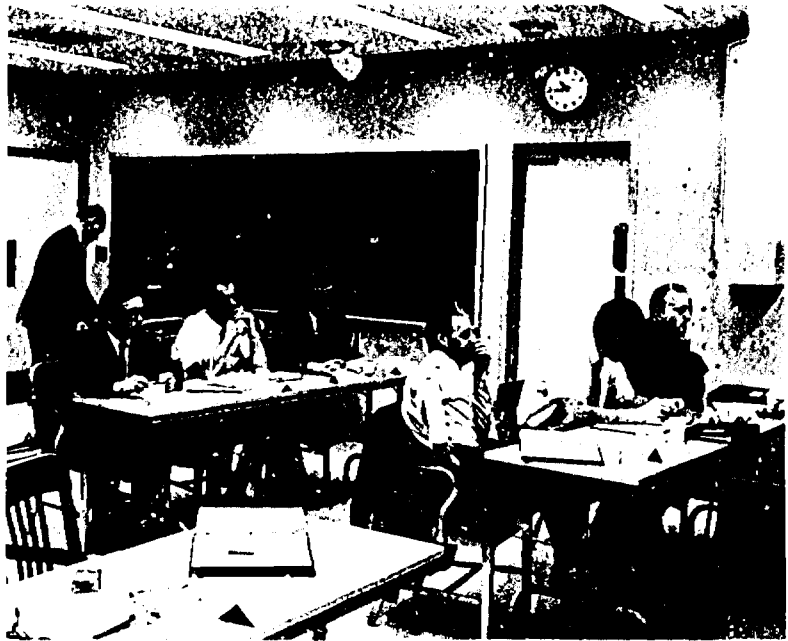
Commercial telephone number: Area Code 201 548-3347, Ext. 47

FTS number: 201-846-4647



COURSES TO BE OFFERED BY
THE NORTHEAST REGIONAL TRAINING CENTER
Edison, New Jersey

Freshwater Pollution Ecology (140.2) September 14-18, 1970
Physical-Chemical Treatment Technology (172.1) November 2-6, 1970
Water Quality Management (160) March 8-12, 1971
Control of Oil and Other Hazardous Materials (165) October 13-15, 1971



Applications

U.S. DEPARTMENT OF THE INTERIOR

FORM APPROVED
BUDGET BUREAU
NO. 42-R1506

Federal Water Pollution Control Administration
Training Program

APPLICATION FOR TRAINING

I. NAME OF APPLICANT:

Mr.
Mrs.
Miss

(first)

(middle initial)

(last)

II. COURSE DESIRED:

Title _____ Course No. _____

Place where given _____ Dates _____

FWPCA Training Office conducting course _____

III. SPONSOR OR EMPLOYER:

Name of Organization or Firm _____

Address _____

Phone _____

IV. MAILING ADDRESS OF APPLICANT (If different from above):

Phone _____

V. PROFESSIONAL STATUS:

Profession or Occupation _____

Position Title _____

Brief description of your present position _____

VI. PREVIOUS WATER POLLUTION CONTROL TRAINING COURSES ATTENDED:

<u>Titles</u>	<u>Dates</u>	<u>Location</u>

VII. EDUCATION:

High School Graduate: ☐ Yes ☐ No ☐

Number of years education completed beyond high school _____

<u>College or University</u>	<u>Date attended</u>	<u>Major</u>	<u>Degree</u>

VIII. SIGNATURES:

Signature of Approving Officer
(Required for FWPCA personnel;
optional for other agencies)

Signature of Applicant

Title

Date _____

MAIL TO THE FWPCA OFFICE CONDUCTING THE TRAINING COURSE

**Manpower and Training Program
Robert S. Kerr Water Research
Center, FWPCA
P. O. Box 1198
Ada, Oklahoma 74820**

**Notional Training Center
Federal Water Pollution Control
Administration
4676 Columbia Parkway
Cincinnati, Ohio 45226**

**Northeast Regional Training Center
Hudson-Delaware Basins Office, FWPCA
Edison, New Jersey 08817**

**Manpower and Training Program
Pacific Northwest Water
Laboratory, FWPCA
200 S. 35th Street
Corvallis, Oregon 97330**

**Training and Manpower Development
Southeast Water Laboratory, FWPCA
College Station Road
Athens, Georgia 30601**

U.S. DEPARTMENT OF THE INTERIOR

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Mr.
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(first)

(middle initial)

(last)

II. COURSE DESIRED:

Title _____ Course No. _____

Place where given _____ Dates _____

FWPCA Training Office conducting course _____

III. SPONSOR OR EMPLOYER:

Name of Organization or Firm _____

Address _____

Phone _____

IV. MAILING ADDRESS OF APPLICANT (if different from above):

Phone _____

V. PROFESSIONAL STATUS:

Profession or Occupation _____

Position title _____

Brief description of your present position _____

Total years experience in profession _____

VI. PREVIOUS WATER POLLUTION CONTROL TRAINING COURSES ATTENDED:

<u>Titles</u>	<u>Dates</u>	<u>Location</u>

VII. EDUCATION:

High School Graduate: No

Number of years education completed beyond high school _____

<u>College or University</u>	<u>Date attended</u>	<u>Major</u>	<u>Degree</u>

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Cincinnati, Ohio 45226**

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Hudson-Delaware Basins Office, FWPCA
Edison, New Jersey 08817

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Pacific Northwest Water
Laboratory, FWPCA
200 S. 35th Street
Corvallis, Oregon 97330

Training and Manpower Development
Southeast Water Laboratory, FWPCA
College Station Road
Athens, Georgia 30601

Chronological Schedule of Courses

FY--71

(July 1970 - June 1971)

Chemical Analyses for Water Quality (100) Cincinnati, Ohio	July 13-24, 1970
Field and Laboratory Activities in Water Quality Surveys (161.1) Corvallis, Oregon	July 20-24, 1970
Orientation to Wastewater Treatment Operation (173) Cincinnati, Ohio	August 3-7, 1970
Operator Instructor Development (180) Cincinnati, Ohio	August 10-14, 1970
Analysis and Control of Thermal Pollution (178) Cincinnati, Ohio	August 24-27, 1970
Freshwater Pollution Ecology (140.2) Edison, New Jersey	September 14-18, 1970
Freshwater Biology and Pollution Ecology (140) Corvallis, Oregon	September 14-25, 1970
Biological Treatment Technology (162) Cincinnati, Ohio	September 14-25, 1970
Characterization and Treatment of Organic Industrial Wastes (101) Athens, Georgia	September 28 - October 9, 1970
Plankton Analysis (141) Cincinnati, Ohio	October 5-16, 1970
Sewage Treatment Facilities for Federal Installations (177) Corvallis, Oregon	October 12-16, 1970 (Alaska)
Sewage Treatment Facilities for Federal Installations (177) Corvallis, Oregon	October 26-30, 1970
Physical-Chemical Treatment Technology (172.1) Edison, New Jersey	November 2-6, 1970
Physical-Chemical Treatment Technology (172.1) Corvallis, Oregon	November 16-20, 1970
Bioassay in Pollution Analysis and Control (149) Cincinnati, Ohio	November 16-20, 1970
Applied Biology Seminar (146) Athens, Georgia	December 1-3, 1970
Physical-Chemical Treatment Technology (172.1) Cincinnati, Ohio	December 7-11, 1970
Analysis and Control of Thermal Pollution (178) Corvallis, Oregon	December 7-10, 1970
Advances in Treatment of Domestic Wastes (172.2) Cincinnati, Ohio	December 14-18, 1970
Current Practices in Water Microbiology (120) Cincinnati, Ohio	January 11-22, 1971
Laboratory Quality Control (150) Ada, Oklahoma	January 19-21, 1971
Applied Biology Seminar (146) Cincinnati, Ohio	January 26-28, 1971
Chemical Analyses for Water Quality (100) Cincinnati, Ohio	February 1-12, 1971
Current Practices in Water Microbiology (120) Corvallis, Oregon	February 1-12, 1971
Membrane Filter Methods in Treatment Plant Operations (121) Athens, Georgia	March 1-5, 1971
Water Quality Management (160) Edison, New Jersey	March 8-12, 1971
Data Evaluation and Analysis (171) Corvallis, Oregon	March 15-19, 1971
Planning and Administrative Concepts of Water Quality Surveys (161.2) Ada, Oklahoma	March 22-26, 1971
Pesticide Ecology Seminar (103.3) Athens, Georgia	March 29-31, 1971
Instrumental Analysis of Chemical Pollutants in the Aquatic Environment (107) Cincinnati, Ohio	April 5-16, 1971
Field Investigation and Sampling Techniques (161.5) Corvallis, Oregon	April 12-16, 1971
Laboratory Analyses in Treatment Plant Operations (105.1) Athens, Georgia	April 19-23, 1971
STORET System (167) Cincinnati, Ohio	April 19-23, 1971
Control of Oil and Other Hazardous Materials (165) Cincinnati, Ohio	May 4-6, 1971
Sewage Treatment Facilities for Federal Installations (177) Athens, Georgia	May 10-14, 1971
Data Evaluation and Analysis (171) Cincinnati, Ohio	May 17-21, 1971
Field and Laboratory Activities in Water Quality Surveys (161.1) Ada, Oklahoma	May 17-21, 1971
Freshwater Biology and Pollution Ecology (140) Corvallis, Oregon	May 17-28, 1971 (Alaska)
Estuary Studies (161.3) Athens, Georgia	June 7-11, 1971
Basic Freshwater Biology (140.1) Cincinnati, Ohio	June 7-11, 1971
Control of Oil and Other Hazardous Materials (165) Corvallis, Oregon	June 15-17, 1971
Freshwater Pollution Ecology (140.2) Cincinnati, Ohio	June 14-18, 1971

FY-72

(July 1971 - December 1971)

Water Quality Studies (161) Corvallis, Oregon July 12-23, 1971
Planning, Development and Management of Wastewater Treatment Facilities (175)
Cincinnati, Ohio July 19-23, 1971

Orientation to Wastewater Treatment Operation (173) Cincinnati, Ohio August 2-6, 1971
Operator Instructor Development (180) Cincinnati, Ohio August 9-13, 1971
Water Quality Studies (161) Corvallis, Oregon August 9-20, 1971
(Alaska)

Water Quality Studies (161) Cincinnati, Ohio September 13-24, 1971
Biological Treatment Technology (162) Cincinnati, Ohio September 27 - October 8, 1971

Sewage Treatment Facilities for Federal Installations (177) Corvallis, Oregon October 4-8, 1971
Control of Oil and Other Hazardous Materials (165) Edison, New Jersey October 13-15, 1971
Advances in Treatment of Domestic Wastes (172.2) Athens, Georgia October 18-22, 1971

Analytical Quality Control (151) Cincinnati, Ohio November 1-5, 1971
Bioassay in Pollution Analysis and Control (149) Cincinnati, Ohio November 8-12, 1971
Estuary Studies (161.3) Corvallis, Oregon November 8-12, 1971
Pesticide Residue Analysis in Water (103.1) Athens, Georgia November 8-12, 1971

Pesticide Residue Analysis in Water (103.2) Athens, Georgia December 6-10, 1971
Use of Photogrammetric Techniques in Water Pollution Control (110)
Corvallis, Oregon December 6-10, 1971
Analysis and Control of Thermal Pollution (178) Cincinnati, Ohio December 13-16, 1971